

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-329737

(43)Date of publication of application : 22.12.1997

t.Cl.

G02B 7/09

G02B 7/00

G02B 7/10

pplication number : 08-174336

(71)Applicant : CANON INC

ate of filing : 13.06.1996

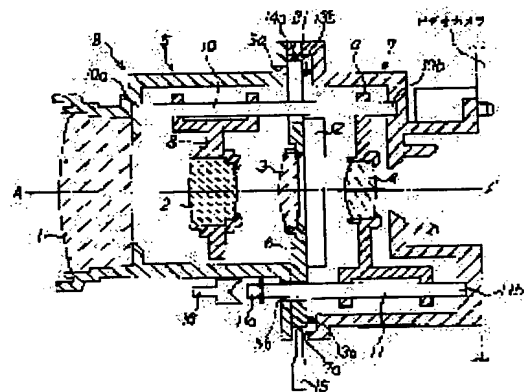
(72)Inventor : ICHISE HARUNOBU

OPTICAL LENS BARREL AND OPTICAL EQUIPMENT USING THE SAME

bstract:

BLEM TO BE SOLVED: To provide an optical lens barrel constituted at an image is prevented from being deteriorated caused by variance a group of respective lenses and between the groups without nding on the high processing accuracy of the individual lenses and the assembling accuracy of the respective lenses with respect to the lens

UTION: A holding member 6 supported by the lens barrel B so as to be y moved in parallel with a direction orthogonally crossed to the tion of an optical axis A-A' and fixed to the lens barrel B at a desired ion is provided with one fixed optical system group 3 out of the plural optical system groups 1 and 3. Besides, a holding member 9 actively coupled to a first guide member 10 and a second guide member 11 so as to be freely moved in the direction of the optical axis A- provided with one moving optical system group 4 out of the plural ng optical system groups 2 and 11. Then, both ends of the first guide member 10 are supported and fixed to the lens barrel B. Besides, the nd guide member 11 is fixed to the lens barrel B at the desired tion in a state where one end thereof is cantilever-supported and the end 11a thereof is supported so as to be freely displaced in the eter direction of itself.



AL STATUS

e of request for examination]

e of sending the examiner's decision of rejection]

d of final disposal of application other than the
miner's decision of rejection or application converted
stration]

te of final disposal for application]

tent number]

te of registration]

mber of appeal against examiner's decision of
ction]

te of requesting appeal against examiner's decision of

ICES *

Patent Office is not responsible for any
errors caused by the use of this translation.

document has been translated by computer. So the translation may not reflect the original precisely.
* shows the word which can not be translated.
ie drawings, any words are not translated.

MS

a(s)]

n 1] It is the optical-system lens-barrel characterized by preparing the fixed optical-system group of one group in attachment component which is supported free [a parallel displacement] in the direction which intersects perpendicularly with the direction of an optical axis at said lens-barrel, and fixes to said lens-barrel in a desired location the fixed optical-system groups of said two or more groups in the optical-system lens-barrel which holds the optical-system group of two or more groups by the lens-barrel in the direction of an optical axis, and changes.

n 2] In the optical-system lens-barrel which holds the migration optical system of two or more groups by the lens-barrel in the direction of an optical axis, and changes one migration optical-system group among the migration optical-system groups of said two or more groups The 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel, And the optical-system lens-barrel characterized by being prepared in the attachment component connected with each of the 2nd guide member which the other end is supported in the shape of a cantilever, the free end is supported by said lens-barrel free [displacement in the direction of a path of itself], and fixes in a desired location free [migration in the direction of an optical axis].

n 3] In the optical-system lens-barrel which holds the fixed optical-system group of two or more groups, and a migration optical-system group by the lens-barrel in the direction of an optical axis, and changes the fixed optical-system group of one group among the fixed optical-system groups of said two or more groups It is prepared in the attachment component which is supported by said lens-barrel free [a parallel displacement] in the direction of an optical axis, and the direction which intersects perpendicularly, and fixes to said lens-barrel in a desired location. One migration optical-system group among the migration optical-system groups of said two or more groups The 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel, And the optical-system lens-barrel characterized by being prepared in the attachment component connected with each of the 2nd guide member which the other end is supported in the shape of a cantilever, and the free end is supported by said lens-barrel free [displacement in the direction of a path of itself], and fixes in a desired location free [migration in the direction of an optical axis].

m 4] It is the optical-system lens-barrel characterized by having been supported free [displacement in the direction of a path] by the hole where, as for said 2nd guide member, the free end was established in said lens-barrel in claim 2 or 3 and having projected to the exterior of said lens-barrel.

m 5] In the optical-system lens-barrel which holds the migration optical system of two or more groups by the lens-barrel in the direction of an optical axis, and changes one migration optical-system group among the migration optical-system groups of said two or more groups The 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel, and the optical-system lens-barrel to which both ends are characterized by being prepared in the attachment component connected with each of the 2nd guide member which is supported free [displacement in the direction of a path of itself], and fixes in a desired location free [migration in the direction of an optical axis] at said lens-barrel.

im 6] In the optical-system lens-barrel which holds the fixed optical-system group of two or more groups, and a migration optical-system group by the lens-barrel in the direction of an optical axis, and changes the fixed optical-system group of one group among the fixed optical-system groups of said two or more groups It is prepared in the attachment component which is supported by said lens-barrel free [a parallel displacement] in the direction of an optical axis, and the direction which intersects perpendicularly, and fixes to said lens-barrel in a desired location. One migration optical-system group among the migration optical-system groups of said two or more groups The 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel, And the optical-system lens-barrel characterized by being prepared in the attachment component connected with each of the 2nd guide member which both ends are supported by said lens-barrel free [displacement in the direction of a path of itself], and fixes to

s-barrel in a desired location free [migration in the direction of an optical axis].

7] Said 2nd guide member is an optical-system lens-barrel characterized by being supported free [displacement in the direction of a path] in the direction of a path in the hole where the other end was prepared in said lens-barrel in claim 5 or 6, and having been supported free [displacement in the direction of a path] by the hole established in said lens-barrel in the hole where the end differs from said hole, and having projected to the exterior of said lens-barrel.

8] It is the optical-system lens-barrel characterized by supporting free [a parallel displacement] in the direction of an optical axis and said lens-barrel cross at right angles the periphery edge of the attachment

9] It is the optical-system lens-barrel characterized for pinching free [a parallel displacement] in the direction the direction of an optical axis and said lens-barrel cross at right angles the attachment component for the fixed -system groups of said one group by the anterior part lens-barrel and the posterior part lens-barrel in claims 1 and 2 by things.

10] It is the optical-system lens-barrel characterized by the fixed optical-system group of said one group being an optical lens in claims 1 and 3 or 6.

[11] It is the optical-system lens-barrel which the fixed optical-system group of said two or more groups and the migration optical-system group constitute an element of zoom optical system in claims 2, 3, and 5 or 6, and is characterized by the migration optical system of the former Norikazu group being a lens which has a competition and a focusing function.

12] The optical instrument characterized by using the optical-system lens-barrel of claim 1 thru/or any 1 term of

relation done.]

CES *

Patent Office is not responsible for any
errors caused by the use of this translation.

document has been translated by computer. So the translation may not reflect the original precisely.
shows the word which can not be translated.
drawings, any words are not translated.

LED DESCRIPTION

ed Description of the Invention]

of the Invention] This invention relates to the optical instrument using the optical-system lens-barrel and it which
ie finely the location of the lens which has a competition sweater and a focusing function as the afocal lens or
ion optical-system group as a fixed optical-system group to a lens-barrel in more detail about the optical-system
arrel of which the fixed optical-system group of two or more groups and migration optical-system group which
ute an element of zoom optical system are held by the lens-barrel, and consist in the direction of an optical axis.

ption of the Prior Art] If it is in the optical-system lens-barrel used for image pick-up equipments, such as a
le video camera, from before, the request of a miniaturization of a lens is especially strong and the miniaturization
ns has progressed. In recent years, the image size of CCD is also miniaturized further and that by which the lens
so microminiaturized is appearing. However, the sensitivity of lens each is also high with the
miniaturization of a lens, and degradation of the image by the inside of the group of a lens and variation between
s became a new problem by the miniaturization of the image size of CCD, and it has risen to surface.
] Then, if it is in the above-mentioned optical-system lens-barrel in order to solve a ***** problem, the guarantee
product has been obtained by raising the process tolerance of lens each, and the assembly precision of each lens to a
arrel, and corresponding, in addition performing the image quality check of an image in an assembly final process.

] lem(s) to be Solved by the Invention] However, in the above-mentioned optical-system lens-barrel, each lens to
ocess tolerance and the lens-barrel of lens each degree[of assembly energy]-raised, since it corresponded, only in
ocess tolerance and assembly precision of lens each, there was a limitation naturally and there was a problem that
ovement in the qualitative dependability of a product could not be aimed at, only by the parts control of such a
onent part. especially the thing for which degradation of an image is prevented only in the components precision of
ponent part when a lens is miniaturized further -- very much -- hard -- moreover, when the inside of the group of
ns built into a lens-barrel and variation between groups were also taken into consideration, there was a difficulty of
hard to be realized as a product.

] It succeeds in this invention that the difficulty like the above accompanying the miniaturization of a lens should
lved. When the effect on image quality performs inclination adjustment and parallel eccentric adjustment to the
tion of an optical axis especially about the lens used as the large candidate for adjustment in the case of the image
ty check of the image in an assembly final process It aims at offer of the optical instrument using the optical-
m lens-barrel and it which can prevent degradation of the image by the inside of the group of each lens and
tion between groups, without being dependent on the advanced process tolerance of lens each, or an advanced
nbly precision of each lens to a lens-barrel.

] ns for Solving the Problem] If it is in the optical-system lens-barrel of this invention in order to attain the above-
ioned purpose In the optical-system lens-barrel which holds the fixed optical-system group of [1]:two or more
ps by the lens-barrel in the direction of an optical axis, and changes in the first place the fixed optical-system group
ie group among the fixed optical-system groups of said two or more groups It is characterized by being prepared in
ttachment component which is supported by said lens-barrel free [a parallel displacement] in the direction of an
al axis, and the direction which intersects perpendicularly, and fixes to said lens-barrel in a desired location, and is

Moreover, if it is in the optical-system lens-barrel of this invention, the migration optical system of [2]: two or more groups is set the second to the optical-system lens-barrel which holds by the lens-barrel in the direction of an optical axis, and changes in it. One migration optical-system group among the migration optical-system groups of said lens-barrel. The 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel. And it is characterized by being prepared in the attachment component connected with each of the 2nd guide member which the other end is supported in the shape of a cantilever, and the free end is supported by said lens-barrel free [displacement in the direction of a path of itself], and fixes in a desired location free [migration in the direction of an optical axis].

Moreover, if it is in the optical-system lens-barrel of this invention, it sets to the optical-system lens-barrel which holds the fixed optical-system group of [3]: two or more groups, and a migration optical-system group by the lens-barrel in the direction of an optical axis, and turns to the third. The fixed optical-system group of one group among the fixed optical-system groups of said two or more groups. It is prepared in the attachment component which is supported by said lens-barrel free [a parallel displacement] in the direction of an optical axis, and the direction which intersects perpendicularly, and fixes to said lens-barrel in a desired location. One migration optical-system group among the migration optical-system groups of said two or more groups. The 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel. And it is characterized by being prepared in the attachment component connected with each of the 2nd guide member which the other end is supported in the shape of a cantilever, and the free end is supported by said lens-barrel free [displacement in the direction of a path of itself], and fixes in a desired location free [migration in the direction of an optical axis].

[especially -- the above [2] or [3] -- setting -- [4]: -- it is characterized by for said 2nd guide member having been supported free [displacement in the direction of a path] by the hole where the free end was established in said lens-barrel, and having projected it to the exterior of said lens-barrel.

Moreover, if it is in the optical-system lens-barrel of this invention, the migration optical system of [5]: two or more groups is set the fourth to the optical-system lens-barrel which holds by the lens-barrel in the direction of an optical axis, and changes in it. One migration optical-system group among the migration optical-system groups of said lens-barrel. It is characterized by being prepared in the 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel, and the attachment component by which both ends were connected with said lens-barrel free [migration in the direction of an optical axis] at each of the 2nd guide member which is supported free [displacement in the direction of a path of itself], and fixes in a desired location.

Moreover, if it is in the optical-system lens-barrel of this invention, it sets to the optical-system lens-barrel which holds the fixed optical-system group of [6]: two or more groups, and a migration optical-system group by the lens-barrel in the direction of an optical axis, and turns to the fifth. The fixed optical-system group of one group among the fixed optical-system groups of said two or more groups. It is prepared in the attachment component which is supported by said lens-barrel free [a parallel displacement] in the direction of an optical axis, and the direction which intersects perpendicularly, and fixes to said lens-barrel in a desired location. One migration optical-system group among the migration optical-system groups of said two or more groups. It is characterized by being prepared in the 1st guide member by which support immobilization of the both ends was carried out at said lens-barrel, and the attachment component by which both ends were connected with said lens-barrel free [migration in the direction of an optical axis] at each of the 2nd guide member which is supported free [displacement in the direction of a path of itself], and fixes to said lens-barrel in a desired location.

[2] especially -- the above [5], or [6] -- setting -- [7]: -- said 2nd guide member is characterized by to support the free end free [displacement] in the direction of a path in the hole established in said lens-barrel, to have been supported free [displacement in the direction of a path] by the hole established in said lens-barrel in the location where the end differs from said hole, and to have projected to the exterior of said lens-barrel.

[3] the above [1], [3], or [6] -- setting -- [8]: -- said lens-barrel [moreover,] Supporting the periphery edge of the attachment component for the fixed optical-system groups of said one group free [a parallel displacement] in a crevice in the direction of an optical axis, and the direction which intersects perpendicularly, [8-2]: said lens-barrel. It is characterized by pinching the attachment component for the fixed optical-system groups of said one group free [a parallel displacement] in the direction which intersects perpendicularly with the direction of an optical axis by the front part lens-barrel and the posterior part lens-barrel etc.

[4] the above [1], [3], or [6] -- setting -- [9]: -- the fixed optical-system group of said one group is characterized by being an afocal lens. [moreover,]

[5] the above [2], [3], [5], or [6] -- setting -- [10]: -- the fixed optical-system group of said two or more groups, and a migration optical-system group -- an element of zoom optical system -- constituting -- **** -- said group -- migration

8/2/2004

system is characterized by being the lens which has a competition sweater and a focusing function. [moreover,] And if it is in the optical instrument of this invention, it is characterized by using [11]:above-mentioned [1] any one optical-system lens-barrel of [10].

If it is in the optical-system lens-barrel of this invention which adopted the means like ****, it is considering as a structure which makes free the parallel displacement of the fixed optical-system group (afocal lens) of one group by an attachment component in the direction of an optical axis, and the direction which intersects perpendicularly. By, looking at the image formation image of a tested piece in the case of the image quality check of the image in an assembly final process, by carrying out the parallel displacement of the fixed optical-system group of said one group by an attachment component in the direction of an optical axis, and the direction which intersects perpendicularly, a parallel eccentric adjustment of the fixed optical-system group concerned is performed, and it becomes possible to fix the attachment component to a lens-barrel in the location where the good image was obtained. The above-mentioned optical-system group set as the object of ***** parallel eccentric adjustment contributes greatly [sensitivity is also in optical design and] to the miniaturization of the whole lens.

] Moreover, the migration optical-system group (lens which has a competition sweater and a focusing function) of one group which moves in the direction of an optical axis on the basis of a guide member can perform now inclination adjustment to the direction of an optical axis, or parallel eccentric adjustment by shaking the free end of the above-mentioned guide member, or an end in the direction of a path. By this, looking at the image formation image of a tested piece in the case of the image quality check of the image in an assembly final process The above-mentioned attachment component is minded for the migration optical-system group of said one group. The free end of a guide member, Or by an end and shaking in the direction of a path, inclination adjustment of the migration optical-system group concerned or parallel eccentric adjustment is performed, and it becomes possible to fix the free end of the guide member, or an end to a lens-barrel in the location where the good image was obtained. The migration optical-system (lens which has a competition sweater and a focusing function) of the one above-mentioned group also has the effect which it has to image quality in optical design, and is a lens group inclination adjustment or parallel eccentric adjusting.

] By having carried out the deer and having adopted the means like ****, supply of the lens miniaturized further is achieved from the former, and manufacture of the optical instrument using the optical-system lens-barrel and it by which supply was stabilized also in image quality moreover is attained.

] [Modiment of the Invention] Hereafter, this invention is explained in more detail based on the operation gestalt shown in an accompanying drawing. Drawing of longitudinal section in which drawing 1 shows the 1st operation gestalt of the optical-system lens-barrel of this invention, drawing of longitudinal section in which drawing 2 shows the 2nd operation gestalt of the optical-system lens-barrel of this invention, drawing of longitudinal section in which drawing 3 shows the 3rd operation gestalt of the optical-system lens-barrel of this invention, and drawing 4 are drawings of longitudinal section showing the 4th operation gestalt of the optical-system lens-barrel of this invention among an accompanying drawing. In addition, in this operation gestalt, although the zoom lens for video cameras is illustrated as optical-system lens-barrel, it is not limited to this.

1] The [1st operation gestalt] Drawing 1 is drawing of longitudinal section of the zoom lens for video cameras, and optical system of this zoom lens has 4 group composition which consists of the forward and forward fixed optical-system groups 1 and 3 of two groups mentioned later, and the forward and forward migration optical-system groups 2 and 4 of two groups.

2] In drawing 1 the front ball lens as a fixed optical-system group and a sign 2 1 The BARIETA lens as a migration optical-system group, The rear relay focus lens as a migration optical-system group of others [sign / 3 / sign / 4 / the afocal lens as a fixed optical-system group, and], The before side lens-barrel as an anterior part lens-barrel which is the configuration member of the lens-barrel B which a sign 5 mentions later, A sign 6 The afocal frame as an attachment component of an afocal lens 3, The posterior part lens-barrel as other configuration members of said lens-barrel B and 8 the BARIETA frame as an attachment component of the BARIETA lens 2, For 9, as for the guide bar as 1st guide member, and 11, the rear relay frame as an attachment component of the rear relay focus lens 4 and 10 are [the guide is 2nd guide member and 12] the iris sections.

3] As shown in this drawing, by comparing junction edges in the direction of optical-axis A-A', and joining together the screw whose junction edge concerned is not illustrated, said before side lens-barrel 5 and said posterior part lens-barrel 7 are connected in one, and form Lens-barrel B. 5a is a hole for the adhesives impregnation for being prepared in the before [Lens-barrel B] side lens-barrel 5, and carrying out adhesion immobilization of the afocal frame 6 at the rear side lens-barrel 5 concerned, and 7a is a hole for adjustment actuation which is established in the posterior part

irrel 7 of Lens-barrel B, and justifies the afocal frame 6 with the below-mentioned external fixture 15. Two or hole 7a for this adjustment actuation is prepared in said posterior part lens-barrel 7 possible [many to /, such as sections or a three way, / justification of the afocal frame 6].

The periphery edge has entered the crevice B1 of Lens-barrel B in which said afocal frame 6 was formed of the on edge of the before side lens-barrel 5 and the posterior part lens-barrel 7. Said afocal frame 6 is supported free parallel displacement] in the direction which intersects perpendicularly with the direction of optical-axis A-A' by more spring members 13a, 13b, and 14a by which the periphery edge has been arranged in a crevice B1. If it puts other way, said afocal frame 6 is supported by the before side lens-barrel 5 and the posterior part lens-barrel 7 free parallel displacement] in the direction which intersects perpendicularly with the direction of optical-axis A-A' by more spring members 13a, 13b, and 14a.

[Said guide bar 10 is prolonged in the direction of optical-axis A-A', support immobilization of the other end 10b is carried out at the before side lens-barrel 5, and support immobilization of the other end 10a is carried out at the posterior part lens-barrel 7.

[On the other hand, it has extended in the direction of optical-axis A-A', and other end 11b is supported by the posterior part lens-barrel 7 in the shape of a cantilever, end 11a becomes the free end (adjustment edge), and said guide bar 11 is supported by the before side lens-barrel 5 free [displacement in the direction of a path of itself]. The free-end penetrated hole 5b prepared in the before side lens-barrel 5, and has projected said guide bar 11 outside. Therefore, the bar 11 can tune now the rear relay focus lens 4 for inclination adjustment, parallel eccentric adjustment, etc. to the direction of optical-axis A-A' by moving the free-end 11a from the exterior with the external fixture 16.

] Said BARIETA frame 8 is connected with the guide bar 10 free [migration in the direction of optical-axis A-A']. Said BARIETA frame 8 is driven with non-illustrated a motor (stepping motor) and a drive (for example, cam) moves in the direction of optical-axis A-A' on the basis of a guide bar 10, and performs variable power of a graphic subject image.

] Said rear relay frame 9 is connected with guide bars 10 and 11 free [migration in the direction of optical-axis A-A']. Said rear relay frame 9 is driven with said non-illustrated motor (stepping motor) and drive (for example, cam) moves in the direction of optical-axis A-A' on the basis of guide bars 10 and 11, and performs focusing of a graphic subject image.

] Next, the adjustment approach of the afocal lens 3 in the optical-system lens-barrel of a **** 1 operation gestalt is explained. Said especially afocal lens 3 has especially the large effect that the parallel eccentricity in a tele edge has image quality, and it is difficult for it to acquire sufficient image quality according to a total error with error at the of a components error and assembly. Therefore, inserting the external fixture 15 in hole 7a for adjustment, and looking at the image formation image of a tested piece in the case of the image quality check of the image assembly final process the direction which intersects the afocal frame 6 perpendicularly with the direction of optical-axis A-A' -- the bearing capacity (if it is in the spring members 13a and 13b -- the contact pressure of the afocal frame 6 to the anterior part lens-barrel 5 --) of the spring members 13a, 13b, and 14a. If it is in spring member 14a, by using it resist and move to the holding power of the afocal frame 6 to the posterior part lens-barrel 7, parallel eccentric adjustment of an afocal lens 3 is performed. This parallel eccentric adjustment is performed by the above-mentioned external fixture 15 from [, such as two directions or a three way,] many. And adhesives, such as UV curing agent, are added in from hole 5a in the location where good image quality was acquired, and the afocal frame 6 is fixed to the before side lens-barrel 5. In this way, generating of gap etc. can be prevented even if, as for the afocal frame 6 by which position immobilization was carried out at the before side lens-barrel 5, external force acts from the outside at Lens-barrel B, since the periphery edge is surrounded by the crevice B1 of Lens-barrel B.

0] Subsequently, the adjustment approach of the rear relay focus lens 4 in the optical-system lens-barrel of a **** 1 operation gestalt is explained. Said rear relay focus lens 4 is a lens group with the large effect to the direction of optical-axis A-A' which inclines or it has on image quality by eccentricity etc. like the above-mentioned afocal lens 3. Therefore, inclination adjustment of the rear relay focus lens 4 or parallel eccentric adjustment is performed by shaking free-end 11a of a guide bar 11 in the direction of a path using the above-mentioned external fixture 17, connecting the external fixture 17 with free-end 11a of a guide bar 11, and looking at the image formation image of a tested piece in the case of the image quality check of the image in an assembly final process. And adhesives, such as UV curing agent, are added in from hole 5b in the location where good image quality was acquired, and free-end 11a of a guide bar 11 is fixed to the before side lens-barrel 5.

1] In addition, in a **** 1 operation gestalt, although two or more spring members 13a, 13b, and 14a intervene between the afocal frame 6 and the crevice B1 of Lens-barrel B The support means (for example, piece of a spring etc.) which have the same function as said each spring members 13a, 13b, and 14a are formed in the afocal frame 6, the

or part lens-barrel 7 which constitutes Lens-barrel B or the before side lens-barrel 5, and one. You may make it at the afocal frame 6 possible [a parallel displacement] in the direction of an optical axis in the crevice B1 of barrel B by the support means.

The [2nd operation gestalt] the optical-system lens-barrel of the 2nd operation gestalt shown in drawing 2 It consists as 4 group configurations from which optical system consists of the forward and forward fixed optical-system groups 1 and 3 of two groups, and the negative and forward migration optical-system groups 2 and 4 of two groups. The end (adjustment edge) 11a of a guide bar 11 was made to project further to the front side of the anterior part lens-barrel 5 of Lens-barrel B, and also it is constituted like the optical-system lens-barrel of the above-mentioned 1st operation gestalt. If it is in the optical-system lens-barrel of a **** 2 operation gestalt, since it compared with the optical-system lens-barrel of the 1st operation gestalt and free-end (adjustment edge) 11a of a guide bar 11 has projected further to the front side of the anterior part lens-barrel 5, the deflection include angle to the direction of a path of free-end 11a of a guide bar 11 becomes small, and very small inclination adjustment of the rear relay focus lens 4 or the parallel eccentric adjustment of it is attained.

The [3rd operation gestalt] the optical-system lens-barrel of the 3rd operation gestalt shown in drawing 3 It consists as 4 group configurations from which optical system consists of the forward and forward fixed optical-system groups 1 and 3 of two groups, and the negative and forward migration optical-system groups 2 and 4 of two groups. The end (adjustment edge) 11a of a guide bar 11 is made to project further to the front side of the anterior part lens-barrel 5 of Lens-barrel B. Hole 7b which carries out adhesion immobilization of the other end 11b concerned with adhesives while ****(ing) other end 11b of a guide bar 11 to the posterior part lens-barrel 7 of Lens-barrel B is prepared. Furthermore, prepared fixed part 7c in the location of rear relay focus lens 4 approach at this posterior part lens-barrel 7, and the other end 11b side of a guide bar 11 was supported in the shape of a cantilever by the fixed part 7c prepared, and also it is constituted like the optical-system lens-barrel of the above-mentioned 1st operation gestalt. If it is in the optical-system lens-barrel of a **** 3 operation gestalt, since the guide bar 11 is supported in the shape of a cantilever in the location of rear relay focus lens 4 approach, inclination adjustment of the rear relay focus lens 4 can be performed without making the rear relay focus lens 4 generate parallel eccentricity by shaking a guide bar 11 focusing at the above-mentioned fixed part 7a.

The [4th operation gestalt] the optical-system lens-barrel of the 4th operation gestalt shown in drawing 4 It consists as 4 group configurations from which optical system consists of the forward and forward fixed optical-system groups 1 and 3 of two groups, and the negative and forward migration optical-system groups 2 and 4 of two groups. a guide bar -- 11 -- an end -- 11 -- a -- ' -- a path -- a direction -- migration -- free -- a lens-barrel -- B -- before -- a side -- lens-barrel -- five -- having prepared -- a hole -- five -- b -- ' -- supporting -- the exterior -- projecting -- making -- hole -- which prepared other end 11b' of said guide bar 11 in the posterior part lens-barrel 7 of Lens-barrel B -- ' -- the direction of a path -- migration -- free -- ****(ing) -- After inclination adjustment of the rear relay focus lens 4 or parallel eccentric adjustment Poured the above-mentioned adhesives into said hole 5b' and 7b', and carried out end 11a' of guide bar 11 at the before side lens-barrel 5, and adhesion immobilization of other end 11b' was carried out at the posterior part lens-barrel 7, respectively, and also it is constituted like the optical-system lens-barrel of the above-mentioned 1st operation gestalt. If it is in the optical-system lens-barrel of a **** 4 operation gestalt, since the both ends of a guide bar 11 are supported by Lens-barrel B movable in the direction of a path, the range of inclination adjustment of the rear relay focus lens 4 or parallel eccentric adjustment can be taken greatly.

As mentioned above, the optical system lens-barrel of this operation gestalt can raise the power (sensitivity) of the lens, when become the product by which quality be stabilized in image quality about the large afocal lens 3 of the system and the rear relay focus lens 4 which be give to image quality, since fine tuning of parallel eccentric adjustment, inclination adjustment, etc. be enable by image quality evaluation in the lens unit condition, and it can respond also to the lens further miniaturized from before.

Moreover -- since the afocal frame 6 is pinched by the anterior part lens-barrel 5 of Lens-barrel B, and the posterior part lens-barrel 7 possible [a parallel displacement] in the direction of optical-axis A-A', and the direction of the optical-axis intersects perpendicularly -- falling -- etc. -- generating can be prevented and parallel eccentric adjustment of an afocal lens 3 is attained.

Moreover, since free-end 11a of a guide bar 11 or end 11a' has projected outside from hole 5b of Lens-barrel B, 5b', inclination adjustment of the rear relay focus lens 4 or parallel eccentric adjustment can be easily performed at the outside of Lens-barrel B.

8] [Effect of the Invention] As mentioned above, looking at the image formation image of a tested piece in the case of the image quality check of the image in an assembly final process according to this invention, as explained Since parallel

ic adjustment of the fixed optical-system group of one group can be performed and inclination adjustment of a on optical-system group or parallel eccentric adjustment of one group can be performed similarly Like before, ation of the image by the inside of the group of each lens and variation between groups can be prevented, without lependent on the advanced process tolerance of lens each, or an advanced assembly precision of each lens to a irrel.

lation done.]

ICES *

Patent Office is not responsible for any errors caused by the use of this translation.

This document has been translated by computer. So the translation may not reflect the original precisely. The word which can not be translated is shown in the drawings, any words are not translated.

VINGS

Figure 1]

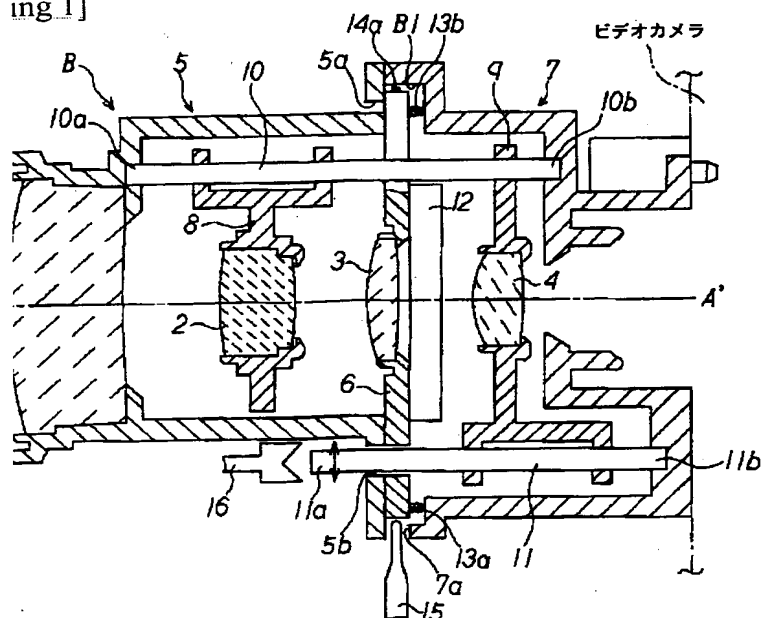


Figure 2]

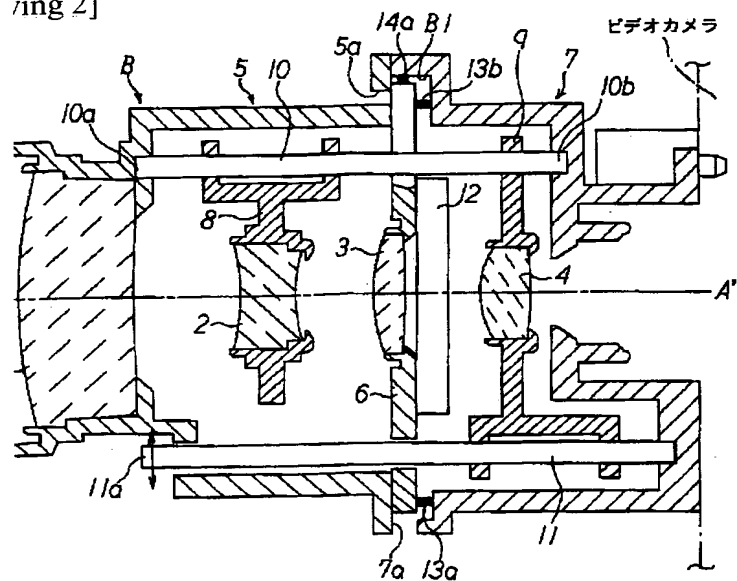


Figure 3]

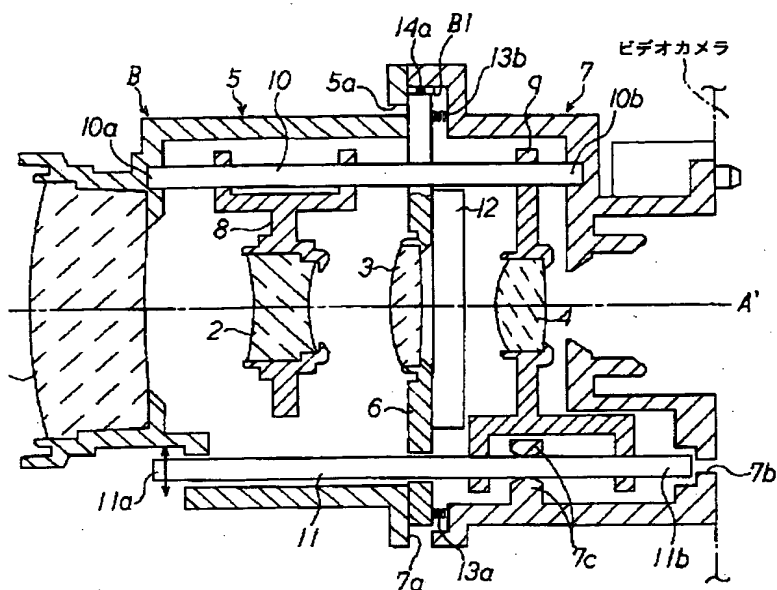
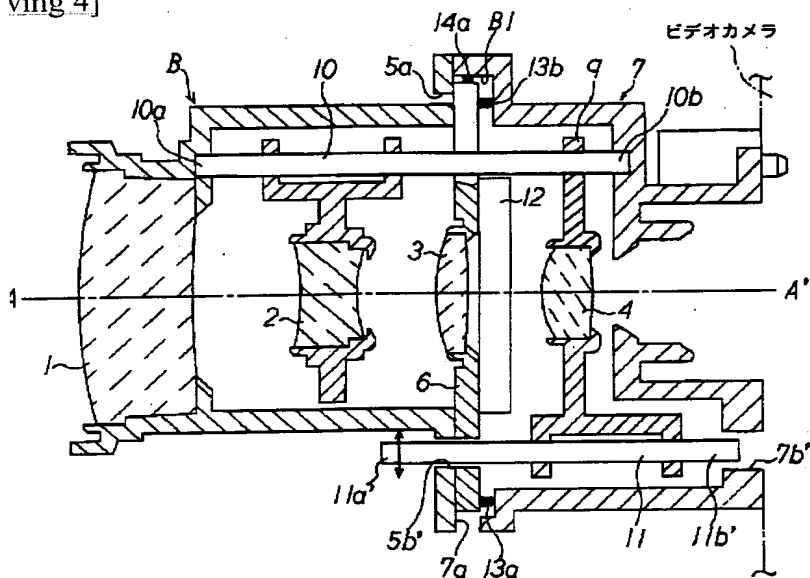


Figure 4]



translation done.]

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.